

PATENT SPECIFICATION

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(54) A COMPOSITE FOOD PRODUCT AND METHOD OF MAKING THE SAME

- 5 (71) We, F.B. MERCER LIMITED, a British Company of Kelly Street, Mill Hill, Blackburn BB2 4PJ, England, and CADBURY SCHWEPPES LIMITED, a British Company, of 1-10 Connaught Place, London W.2., do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-
- 10 This invention relates to a composite food product and to a method of making the same.
- It is an object of the present invention to provide a composite food product which has an attractive appearance and pleasant eating qualities.
- 15 According to an aspect of the present invention, there is provided a composite food product comprising (1) a tube whose wall is composed of a net having mesh strands and intersections which are integrally formed of said edible material by an extrusion process, (2) a filling of another edible material within the tube and in contact with the inner surface of the tube wall.
- 20 According to another aspect of the present invention, there is provided a method of making a composite food product comprising the steps of extruding an edible material through die orifices so as to produce a tube whose wall is composed of a net having mesh strands and intersections which are integrally formed of said edible material, and providing a filling of another edible material in the tube so that the filling contacts an inner surface of the tube wall.
- 25 The use of a net tube gives the food product a distinctive texture and a distinctive appearance or decorative effect. Furthermore, the net structure can enable the flavour of the food product to be detected more quickly in the mouth. In addition, the net tube can provide an economical sheath for covering a greasy or sticky filling which is not easily held in the fingers. Thus the net can be formed by feeding the edible material through die orifices defined between a pair of die members of which at least one is rotatable or oscillatable relative to the other in order to produce a tube net. The dies may be as described with reference to Figures 1 to 5 of British Patent Specification No. 836 555.
- 30 The net tube may be coated with a food such as chocolate, a chocolate-like coating, a fat-based coating or a fondant.
- 35 The net tube is preferably substantially rigid and acts as a support for the filling. However, the filling may act in some cases as a support for the net tube as well as adding edible appeal.
- 40 The net tube may be formed of any one or more of many foods including confectionery, for example, cereal bases, e.g. maize, oats, rice, wheat, potato, millet, modified starches and proteinaceous materials, e.g. edible soya cotton seed protein, ground nut protein and

wheat gluten.

For cereal bases, used to form the net tube, the normally preferred method of producing the base is that using a cook extruder - cook extruders are well known. In this, the previously moisture-controlled cereal material is extruded under high pressure and high temperature through a die and as it leaves the die, rapid evaporation of moisture takes place to produce a "puffed" product.

Normally cook extruders produce an extruded product which still retains a high moisture content of approximately 10% w/w, which then requires drying down to a level of approximately 2% w/w. If the net tube contains a fat-based filling with a low heat stability, such drying is impracticable. Thus, in such an event, the moisture content of the net tube shortly after extrusion is such that no substantial drying is subsequently required, and is, for instance, approximately 2% w/w. This can be achieved if the net tube is extruded at high temperature and/or high pressure, for instance at a temperature substantially above 100°C, for example about 200°C, and at a pressure of for example 200-300 p.s.i. (about 0.15-0.2 Kg/mm²). The temperatures and pressures are preferably chosen so that the net tube "flashes-off" its moisture content immediately on extrusion; the pressures and temperatures also determine the ultimate density of the finished net tube.

A further application for cereal bases relies on extruding a starch based paste in such a way that little or no flash-off of moisture takes place to produce a gelatinised, relatively dense product. This, after drying, is fried in fat to produce an expanded material containing a substantial proportion of fat from the frying oil. In each of these cases, the extruder has fitted to it a net-forming die, for example, a die of the type described with reference to Figures 1 to 5 of British Patent Specification No. 836 555 or in British Patent Specification No. 1 072 113.

The method can also be applied to fat-based materials such as chocolate, chocolate-like substances and other fat-based confections. For this application, the fat-based material can be brought to the correct extrusion temperature and, in the case of chocolate, tempered in the usual way to ensure good gloss and finish in the final product as in standard chocolate technology, then extruded through a cooled net-forming die, starting on a cooled mandrel and then passing on to a take away belt, preferably after cutting as the material leaves the mandrel. The filling can also be applied as in the other cases by making use of an axial hollow mandrel passing through the extrusion head and feeding filling through this and into the net tube as it is formed.

Alternatively, the net tube can be made from a sugar-based material, e.g. caramel (toffee), nougat, liquorice paste, high boiled sugar, mallow, fudge, fondant and marzipan, provided that such a sugar-based material is extrudible.

For net tubes formed of edible products such as caramel or nougat, a gear or screw extruder can be used and extrusion takes place at relatively low temperatures, although for high boiled - sugar materials a higher temperature is used, say, in the region of 137°C.

In some cases, it is essential to cool the extruded material as it leaves the die so that it maintains its tubular shape. For this purpose, cold air or nitrogen from a liquified supply can be applied.

The centre filling can be made by conventional confectionery manufacturing techniques and consist of two essential types:

- 45 a) Water-based material e.g. mallow, nougat, coconut paste, fudge, jelly and fondant
- b) Fat-based materials, e.g. chocolate, chocolate-like substances, biscuit spreads and cheese spreads.

In general terms, the centre filling can continuously advance along the axis of the net tube as the latter is extruded. Though not essential in all circumstances, the center filling is preferably extruded at substantially the same time as the net tube. The method of filling each of these centres into the net tube can thus rely on continuously pumping or extruding the base into the net tube through a hollow tube or mandrel in the tubular net-forming die head.

In general, it is desirable to have the centre filling, in a radial sense, as near the die orifices as possible, particularly if a centre filling is being used which does not expand much after extrusion. In order to achieve this, the net can be extruded using at least one die whose die orifices are directed towards the axis of the die, thereby placing the net onto the centre filling. It should be noted however, that this is not always necessary, depending upon the material of the net. For instance, a material such as caramel could be drawn out or could shrink naturally onto the centre filling even when extruded with die orifices parallel to the axis of the die.

In general, it is desirable to support the net as it emerges from the die orifices. Depending upon the nature of the net and of the centre filling, the net may be supported at least initially by a tube or mandrel down which the centre filling advances, or may be supported, at least after a short interval, by the advancing centre filling itself. Preferably, the net is

- initially supported by the tube or mandrel and then by the filling until the net itself has set and becomes self-supporting, the tube or mandrel thus acting as a support for the formed net for a length of time depending on the net material and operation parameters. Many centre fillings, particularly those which are fat based, should be cooled to ensure that their temperature as a whole does not rise to such an extent that the fat melts or they become unduly soft, and to achieve this, the tube or mandrel referred to above can be cooled. None the less, it is desirable that as the filling contacts the net, the heat of the net melts a layer on the surface of the filling to effect adhesion between the filling and the net. This prevents part of the filling falling out of the net casing when the product is chewed.
- The composite product of net and filling, after cooling, can then be cut to whatever length is desired and can either be packed for consumption in this form or can pass to a subsequent operation, an example of which is chocolate enrobing. The net can be covered in chocolate, chocolate-like substance and other fat-based material. It can alternatively be coated with a water-based material e.g. fondant icing to form the finished food product.
- Other methods of production are possible. For instance particularly when using a cold extrusion process, the net tube can be cut into lengths at the extruder die faces.
- The product is preferably in the form of a snack, i.e. in a form in which it can be sold as an individual item to be held in the hand and eaten.
- The following are examples of specific forms of composite food product according to the present invention:-
- (a) A substantially rigid, extruded tubular net of cereal-based material, such as corn-based, wheat-based or rice-based material, and an extruded filling of fat with cheese, milk or savoury flavouring.
 - (b) A substantially rigid, extruded tubular net of potato-based material and an extruded filling.
 - (c) As (a) or (b) and dipped in an onion-flavoured coating.
 - (d) A substantially rigid, extruded tubular net of caramel, and an extruded filling of a mixture of peanut butter and peanuts.
 - (e) A substantially rigid extruded tubular net of cereal-based material, dipped in a chocolate coating, and having an extruded filling of nougat.
- The invention will be further described, by way of example, with reference to the accompanying drawings, of which:-
- Figures 1 to 6 illustrate a number of forms of the net mesh construction;*
- Figure 7 is a general view of an embodiment for carrying out the invention;*
- Figure 8 is a vertical section through one die head which can be used in the embodiment of Figure 7; and*
- Figure 9 is a vertical section through another die head which can be used in the embodiment of Figure 7;*
- The net mesh construction can take a variety of forms, some of which are illustrated as follows:
- Figure 1 - rotating either inner or outer die of Figures 1 to 5 of British Patent Specification No. 836 555 whilst keeping the other die stationary;
- Figure 2 - rotating both the inner and outer dies of Figures 1 to 5 of British Patent Specification No. 836 555;
- Figure 3 - oscillating either the inner or outer die of Figures 1 to 5 of British Patent Specification No. 836 555 whilst keeping the outer die stationary;
- Figure 4 - oscillating both the inner and outer dies of Figures 1 to 5 of British Patent Specification No. 836 555;
- Figure 5 - varying the number of slots or the pattern in which they are cut into the dies of Figures 1 to 5 of British Patent Specification No. 836 555, thereby further varying the pattern;
- Figure 6 - square mesh pattern in accordance with British Patent Specification No. 1 072 113.
- The products can be further varied by operating at different speeds or by oscillating by a greater or lesser amount in the case of Figures 3 and 4.
- The ingredients of the food product net are dry mixed in a conventional manner and are conditioned by adding moisture, and are then fed to an extruder 1, shown in Figure 7. The specific extruder 1 may be of twin-screw design for producing high pressure and may have induction heating for producing high temperature. The extruder 1 has a die head 2 which can be generally of the type described in British Patent Specification No. 836 555.

A centre filling is made of a fat-based material, and may for example be produced by mixing a paste slurry in a conventional paddle mixer or turbine mixer, which is illustrated by a container 3 having a heated jacket 4 and provided with a mixer 5. The centre filling mix is then pumped by a pump 6 to a continuous scraped-tube heat exchanger 7 e.g. a heat exchanger sold under the Registered Trade Mark VOTATOR, together with gaseous nitrogen or another inert gas introduced through a duct 8. In the heat exchanger 7, the centre filling mix is whipped and cooled under pressure, e.g. 0.07 to 0.2 Kg/mm², its density being reduced approximately 1.0 to 0.6 gms/cc. The mix leaves the heat exchanger 7 via a pressure control valve 9 and passes through the extruder die head 2 in a tube or hollow mandrel 10 (see Figures 8 and 9) cooled down to about 4 to 5°C.

In the arrangement of Figure 8, the tube 10 extends beyond the die head 2, and the filling expands slightly on leaving the end of the tube. The die head 2 is conventional in that it has two relatively rotatable or oscillatable annular dies 11, 12, each of which has a ring of extrusion die orifices. However, the extrusion die orifices are inclined towards the axis of the dies. The arrangement, of Figure 8 is such that the net 13 is still hot enough to slightly melt the surface of the filling 14 when the net 13 passes over the end of the tube 10 and engages the advancing filling.

In the arrangement of Figure 9, the filling is a non-fat filling, and the tube 10 does not extend beyond the die head 2.

Embodiments of composite food products of the present invention and their methods of manufacture will now be described in the following examples where, unless otherwise specified, all percentages or parts are by weight:-

Example I

A mixture of:-

57%	White Flour
20%	Maize Grits
20%	Potato Pectin Cellulose
3%	Salt

is fed at room temperature into a screw extruder. The material passes through the extruder where it is heated to a temperature of approximately 175°C (although it could be in the range of 150-200°C) and emerges from a net-forming die of the type described in Figures 1 and 2 of British Patent Specification No. 836 555 where expansion takes place as moisture is quickly released. The final moisture content is approximately 6% (although it could be 6-9%). Immediately upon emerging from the die orifices, the extruded tubular net is filled with a fat-based material in the manner herein described with reference to Figures 7 and 8, whereby a filled tubular net product is produced.

A suitable fat-based material comprises:

Soft fat	28.9%
H.P.K.O.	40%
Cheese Powder	20%
Milk Powder (skimmed or full cream)	10%
Salt	1%
Flavour enhancer	0.1%

The use of a fat-based material is preferred because it is compatible with the tubular net which is cereal based. Water-based filling material is not preferred as moisture transfer can take place which tends to soften the net and make the food product less desirable. The resulting puffed and filled net is sprayed with a fat and, in this embodiment, has a powdered flavour applied to it. After cooling, it is cut to length. The resultant food product is a length of cereal-based tubular net filled with a fat-based material. The product has a distinctive appearance and provides a pleasing contrast in taste and texture between the net and the filling.

Example 2
Example 1 is repeated using:-

Example 3
Example 1 is repeated using:

15 57% Wholemeal Flour
16% Maize Grits
8% Milled Wheatgerm
18% Instant Potato Granules
3% Salt

20 to produce a composite food product consisting of a substantially rigid tubular net filled
with fat-based material.

Example 4 A caramel made, in a conventional manner, to the following recipe:

	Glyceryl Monostearate	0.326	
30	Trisodium Citrate	0.766	30
	Skimmed Sweetened Condensed Milk	12.674	
	Whey Powder	17.557	
35	42DE Glucose	42.657	35
	Granulated Sugar	16.941	
	HPKO	13.320	
40	Salt	0.419	40
	Ethyl Vanillin	0.005	
45	Isopropyl Alcohol	0.035	45
	Butter Flavour	0.181	
	Egg Albumen Powder	0.171	
50	Calcium Lactate Anhydrous	0.017	50
	Water	6.000	

55 is cooled to approximately 45-60°C and fed to a conventional gear or screw extruder. This forces the material through a net-forming die which continuously produces a tubular net of caramel. This is supported for approximately 15 cms on a hollow mandrel which is coated with a suitable anti-stick material such as polytetrafluoroethylene. The tubular caramel net is filled with a mallow composition as it emerges from net-forming die. The mallow composition is fed through the hollow mandrel. In this Example, the mallow composition is produced, using a high boiled sugar syrup comprising, in parts by weight,

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	Granulated Sugar	46.841	
	42DE Glucose Syrup	29.306	
5	Invert Sugar Syrup	12.136	5
	230° Bloom Gelatine	2.385	
	Vanilla Flavour	0.208	
10	Water	16.000	10

15 The mallow is produced continuously on a conventional plant by dissolving egg albumen in water and incorporating this with the high boiled sugar syrup which subsequently passes to a continuous machine of the rotary type which reduces the density to 0.2-0.6 gms/cc before discharging the mallow through the mandrel into the centre of the caramel net. The mallow acts as a support for the caramel net to prevent it collapsing and the combined material passes on a belt through a cooler with air circulation before passing to a cutting station where it is cut to the desired length and passed directly to a conventional chocolate enrober where the lengths of extruded caramel net are covered with chocolate or a chocolate-like substance. In some instances, the chocolate or chocolate-like substance may be sprayed onto the tube as it leaves the first air cooler.

20 Attention is drawn to our present British Patent Application 3912/78 (Serial No. 1604585) which describes and claims a food product which comprises a net having mesh strands and net intersections which are intersections which are integrally formed of an edible material by an extrusion process.

25 WHAT WE CLAIM IS:-

- 30 1. A composite food product comprising (1) a tube whose wall is composed of a net having mesh strands and intersections which are integrally formed of edible material by an extrusion process, (2) a filling of another edible material within the tube and in contact with an inner surface of the tube wall.
- 35 2. A composite food product as claimed in claim 1, wherein said tube substantially rigid and completely surrounds the said filling in the circumferential direction of the tube so as to support the latter.
- 40 3. A composite food product as claimed in claim 1 where in said filling acts as a support for said tube.
- 45 4. A composite food product as claimed in any preceding claim, wherein said filling is a water-based edible material.
- 50 5. A composite food product as claimed in any one of claims 1 to 3 wherein the filling is fat-based edible material.
- 55 6. A composite food product as claimed in any preceding claim, wherein the edible material forming the net is a material based on cereal and or potato.
- 60 7. A composite food product as claimed in any one of claims 1 to 5, wherein the edible material forming the net is a fat-based material.
- 65 8. A composite food product as claimed in any one of claims 1 to 5 wherein the edible material forming the net is a sugar-based material.
- 70 9. A composite food product as claimed in claim 6, wherein the net is one that has been extruded from an extrusion apparatus which cooks the edible material.
- 75 10. A composite food product as claimed in claim 6 or 9 wherein the net is one which has been fried after extrusion.
- 80 11. A composite food product as claimed in claim 6, 9 or 10 wherein the net is of expanded edible material having a moisture content of 2 to 9% by weight.
- 85 12. A composite food product as claimed in claim 7, wherein the edible material is chocolate.
- 90 13. A composite food product as claimed in claim 8 wherein the edible material is caramel or fudge.
- 95 14. A composite food product as claimed in any preceding claim wherein the tube has a further edible material thereon.
- 100 15. A method of making a composite food product comprising the steps of extruding an edible material through die orifices so as to produce a tube whose wall is composed of a net having mesh strands and intersections which are integrally formed of said edible material, and providing a filling of another edible material in the tube so that the filling contacts an inner surface of the tube wall.
- 105 16. A method as claimed in claim 15, wherein said edible material forming the net is a

- cereal and/or potato-based material and the extrusion of such material is effected under high pressure and temperature so that a rapid evaporation of moisture takes place to produce a net of expanded edible material.
17. A method as claimed in claim 16, wherein the moisture content of the net shortly after extrusion is such that no substantial drying is subsequently required. 5
18. A method as claimed in claim 17, wherein the extrusion is effected so that the material loses moisture immediately on extrusion.
19. A method as claimed in claim 15, wherein the net tube is formed of a starch-based paste and little or no flash off of moisture takes place on extrusion, the extrusion producing 10 a gelatinised, relatively dense product which is dried, and then fried in fat to produce an expanded material.
20. A method as claimed in any one of claims 15 to 18, wherein said another edible material is fed into the net tube as it is extruded.
21. A method as claimed in claim 20, wherein the net tube is extruded using at least one die whose die orifices are directed towards the axis of the die, thereby placing the net tube 15 onto said another edible material.
22. A method as claimed in claim 20 or 21 wherein the net tube is supported, at least after a short interval, by said another edible component until the net tube has set and becomes self-supporting.
23. A method as claimed in claim 22, wherein the net is initially supported by a tube or hollow mandrel, and then by the filling. 20
24. A method as claimed in any one of claim 20 to 23 wherein, as the filling contacts the net, the heat of the net melts a layer on the surface of the filling to effect adhesion between the filling and the net.
25. A method as claimed in any one of claims 15 to 21, further including the step of applying a further edible material to the net tube. 25
26. A method as claimed in claim 15, substantially as hereinbefore described with reference to the accompanying drawings or in any one of Examples 1 to 4.
27. A composite food product when made by a method as claimed in any one of claims 30 18 to 26.
28. A composite food product substantially as hereinbefore described in any one of Examples 1 to 4. 30

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COMPLETE SPECIFICATION

2 SHEETS

*This drawing is a reproduction of
the Original on a reduced scale
Sheet 1*

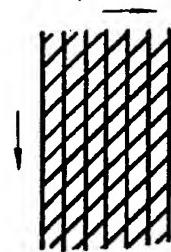


FIG. 1.

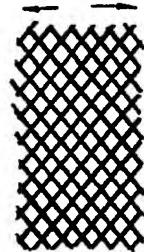


FIG. 2.

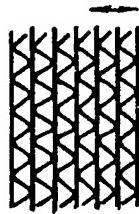


FIG. 3.

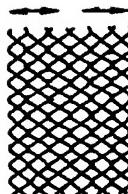


FIG. 4.

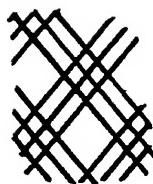


FIG. 5.

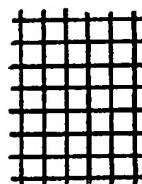


FIG. 6.

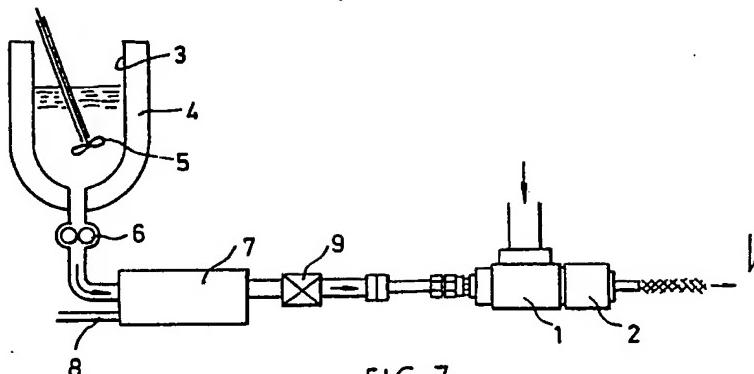


FIG. 7.

1604586 COMPLETE SPECIFICATION

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Sheet 2

